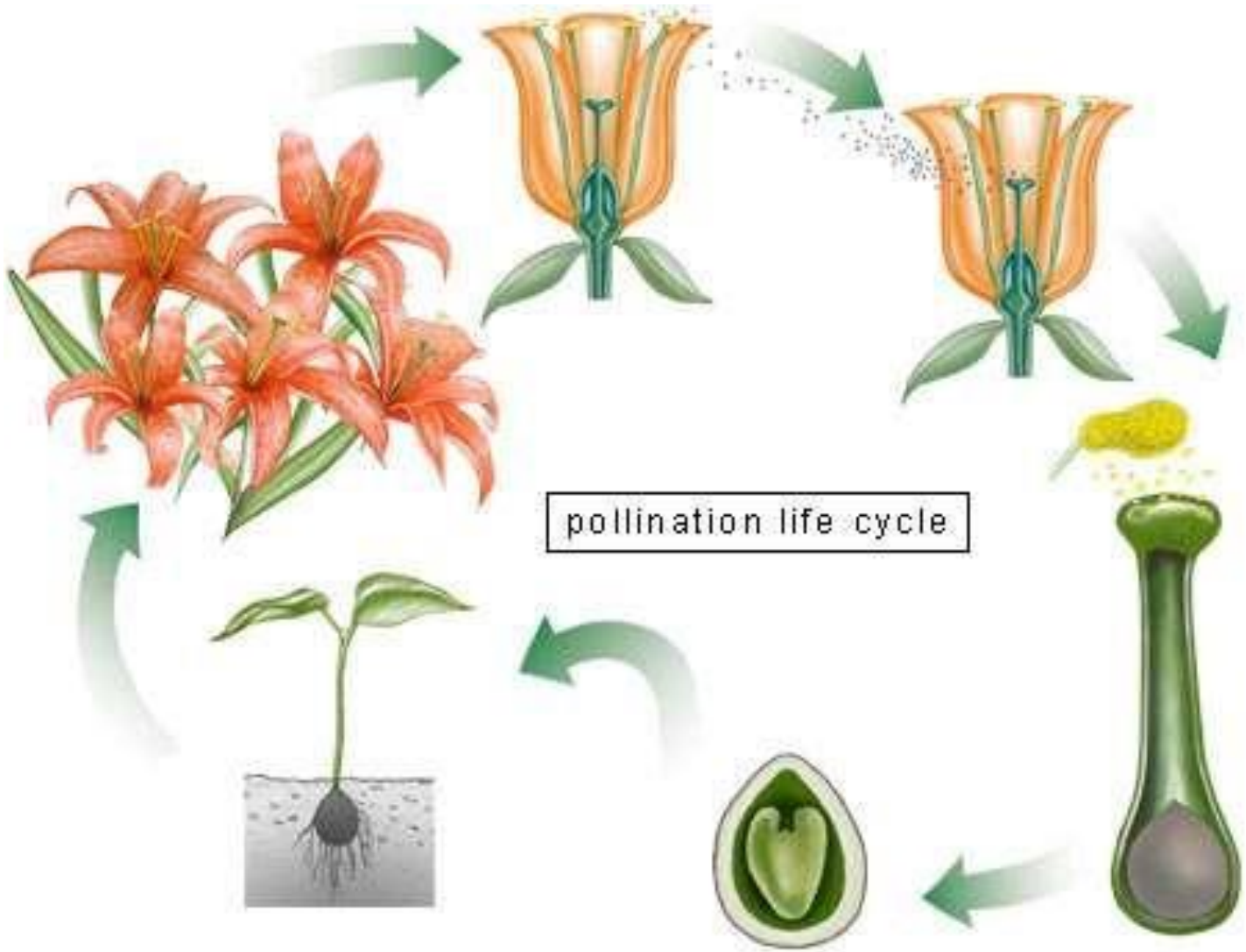
BOT-RC-4016

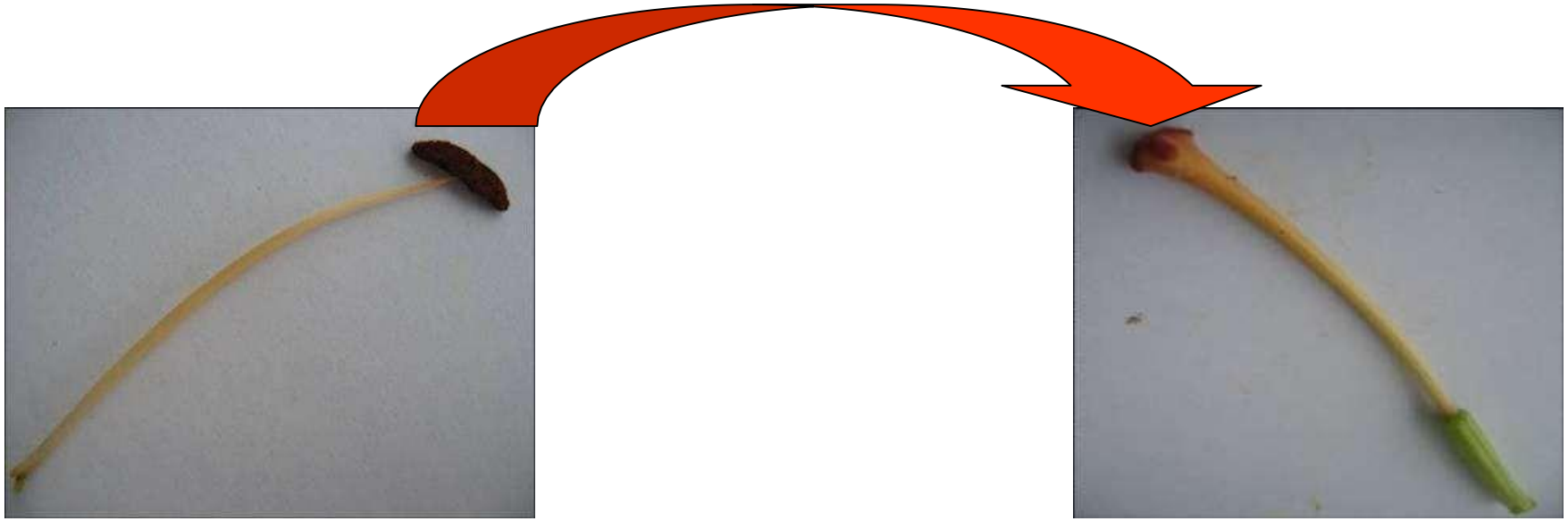
(Plant Anatomy and Embryology)

Unit 6: Pollination mechanisms and adaptations

Pollination



Pollination



Transfer of pollen from the anther to the stigma of a flower of the same species

Agents of Pollination

- Plants utilize two abiotic (**Wind and Water**) and one biotic (**Animals**) operators to accomplish pollination. Majority of plants utilize biotic operators for pollination. Just a little extent of plants utilizes abiotic operators.

  - **Anemophily**: The pollination happened by the impact of wind as an operator is called **Anemophily**.
  - **Hydrophily:** The pollination happened by the impact of water as an operator in hydrophytes is called **Hydrophily**.
  - **Zoophily**: The pollination happened by the impact of creatures as an operator is called **Zoophily**.

- On the basis of various sorts of creatures involved in pollination, they are grouped into:

  - **Entamophily**: The pollination happened by the impact of insects as an operator is called **Entamophily**.
  - **Ornithophily**: The pollination happened by the impact of birds as a specialist is called **Ornithophily**.
  - **Chirapterophily**: The pollination happened by the impact of bats as a specialist is called **Chirapterophily**.

Types of Pollination

Self pollination

Transfer of pollen from an anther to a stigma of the same plant

Cross pollination

Transfer of pollen from the anther to the stigma of a different plant of the same species

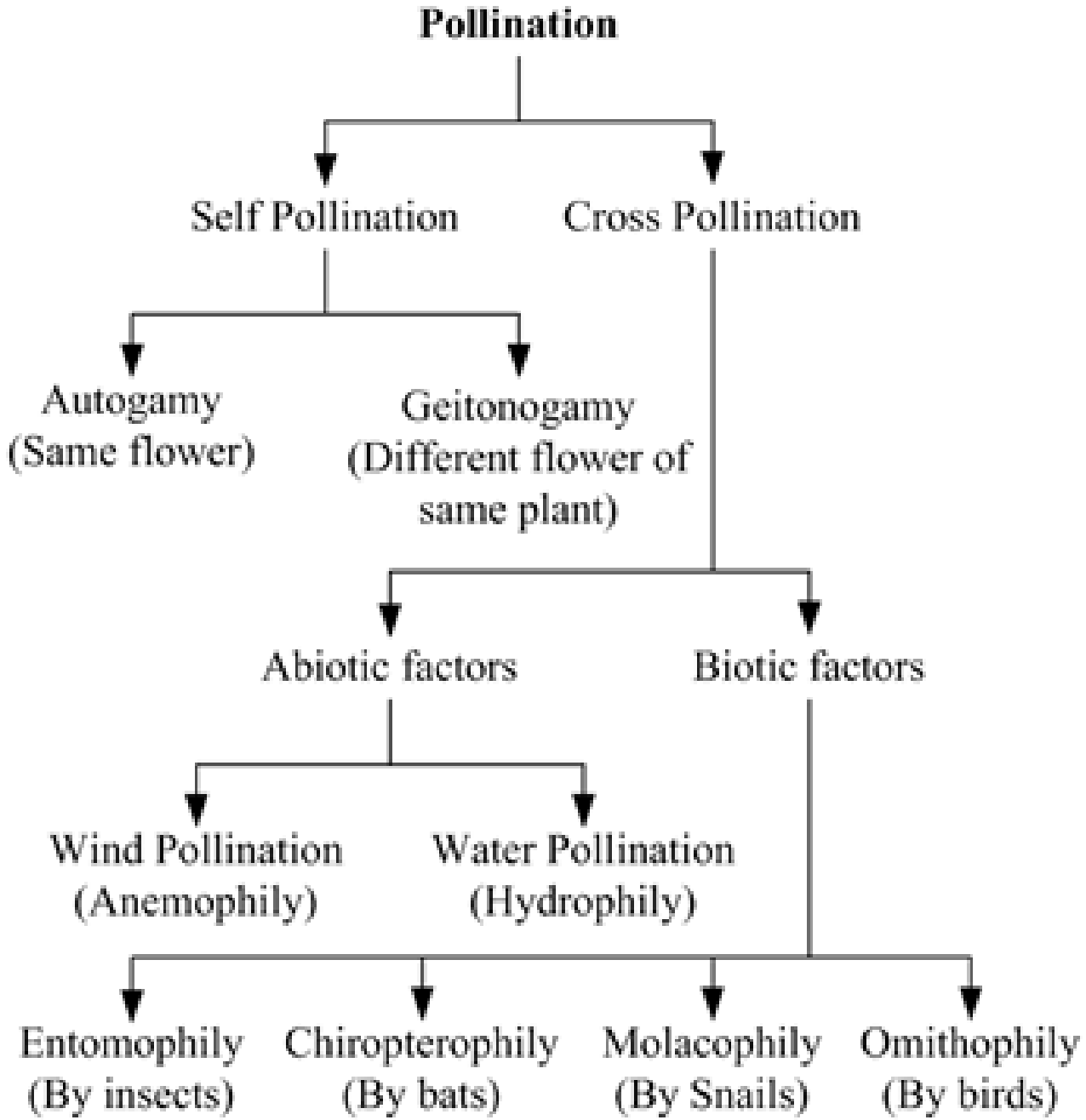
Agents of Pollination

Abiotic

- Wind → 
- Water → 

Biotic

- Insects → 
- Birds → 
- Bats → 
- Snails → 
- Larger animals including man → 


Pollination
Self Pollination
Cross Pollination
Autogamy
(Same flower)
Geitonogamy
(Different flower of
same plant)
Abiotic factors
Biotic factors
Wind Pollination
(Anemophily)
Water Pollination
(Hydrophily)
Entomophily
(By insects)
Chiropterophily
(By bats)
Molacophily
(By Snails)
Omithophily
(By birds)

Biotic pollination agents
Pollination by animals (organisms)

- 80% of all pollination is biotic
- **Insects (Entomophily)**
- **Butterflies (Psychophily)**
- **Moths (Phalaenophily)**
- **Flies (Sapromyiophily)**
- **Birds (Ornithophily)**
- **Bats (Cheiropterophily)**

Abiotic pollination

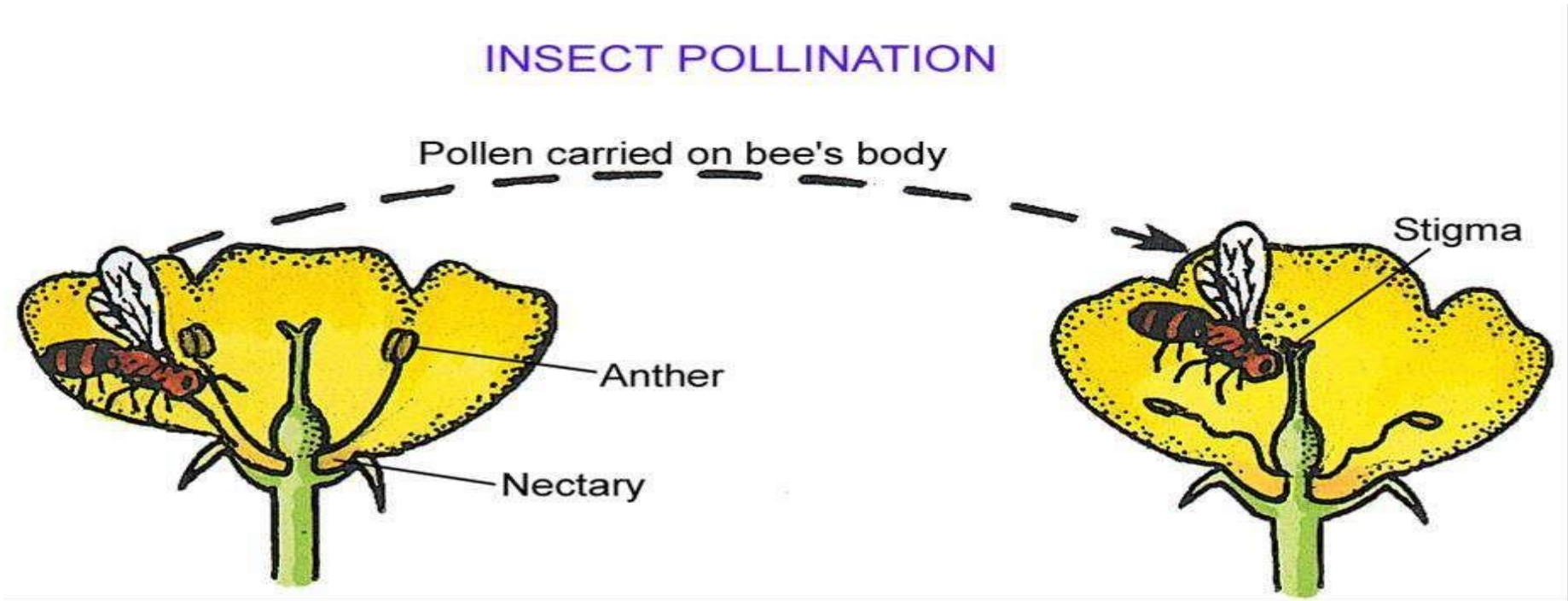
Pollination by non-animal factors

- **Amenophily**
  - Pollination by wind (98% of abiotic pollination)
- **Hydrophily**
  - Pollination by water (aquatic plants)
  - A. epihydrophilly- mediated by surface water= Vallisneria.
  - B. hypohydrophilly- bottom water- Zostera.

Adaptations for animal (insect) pollination

- Petals brightly coloured, scented with nectary
- Small amounts of sticky pollen
- Anthers inside petals
- Stigmas sticky, inside petals

INSECT POLLINATION



Adaptation for Wind pollination

- Light
- Non-sticky
- Well-exposed stamens
- Large often-feathery stigma
- Single ovule in each ovary
- Inflorescence
- Common in grasses

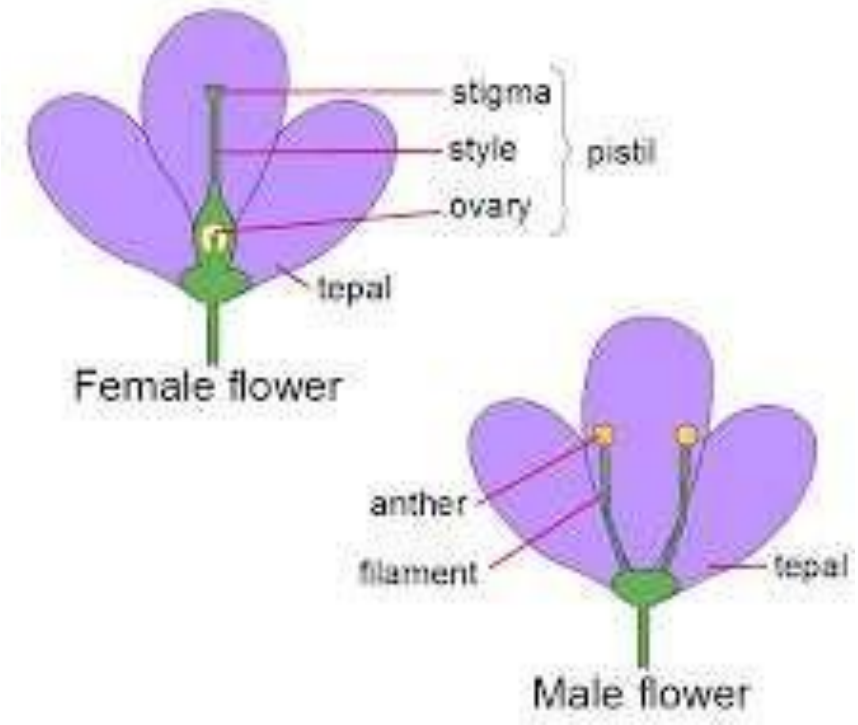
  Winged

Adaptation for Outbreeding

- To overcome inbreeding depression
- Pollen release and stigma receptivity not synchronized
- Anther and stigma placed at different positions
- Self incompatibility
- Production of unisexual flowers
- Monoecious/dioecious condition

The following six types of devices promote and ensure outbreeding through cross pollination:

1. UNISEXUALITY (Dicliny): Flowers are unisexual or diclinous. Plants may be monoecious (eg. Maize, castor) or dioecious (eg. Mulberry, papaya, date palm).

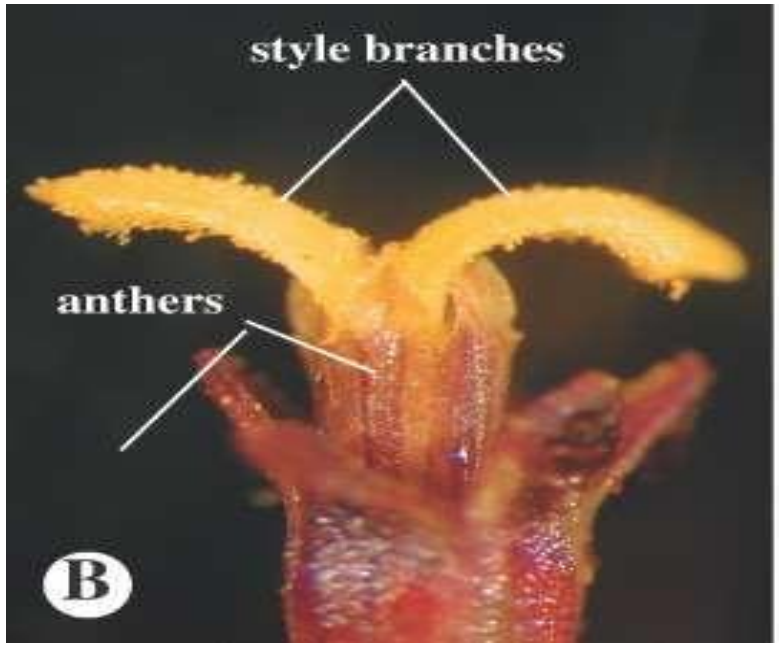


2 . DICHOGAMY: (Gk-dicha- in two, gamos- marriage)

Here in a bisexual flower, anthers and stigmas nature at different times, so that self pollination is inhibited.

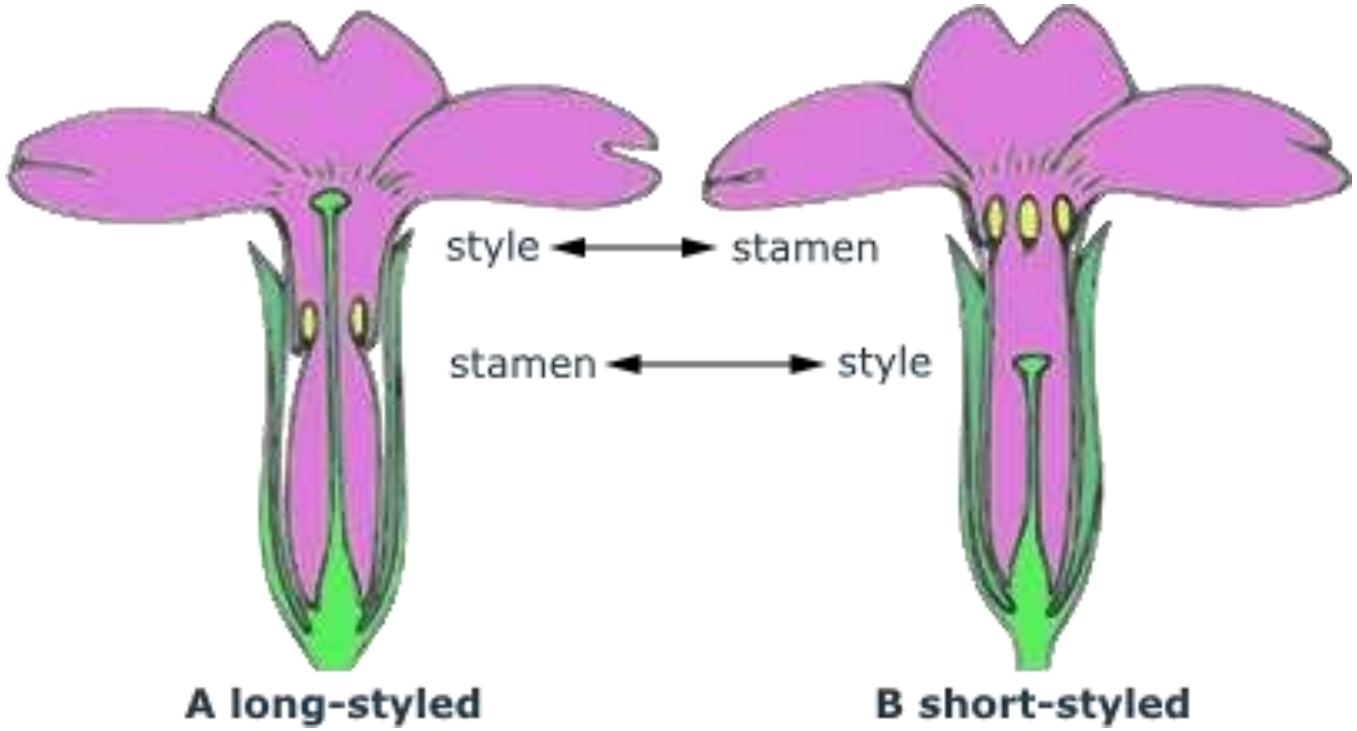
Eg. Clerodendron, Salvia, Sunflower, Rose, Magnolia, Gloriosa etc.

protandry - male first
protogyny - female first

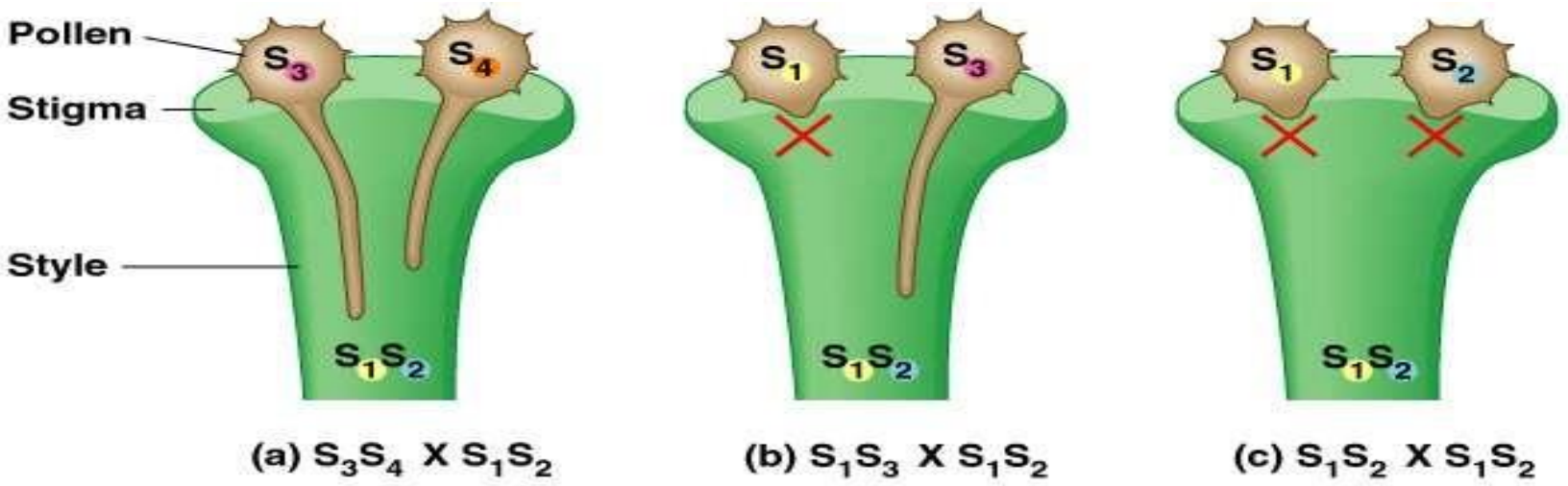


3 . HETEROSTYLY: Flower have different types of height of styles and stamens.

Eg. Jasmine, Primrose, Lythyrsus, Oxalis.



4. SELF-STERILITY- **Pollen grains of one flower are incapable of** growing over the stigma of same flower due to the presence of similar sterile genes.
Eg. Crucifers, Potato, Tobacco, Gramineae, Orechidaceae.



5. HERKOGAMY: They are mechanical devices that prevent self pollination and favour cross pollination even in homogamous flowers.
Ex:Hibiscus

6. PREPOTENCY: Pollen grains of one flower grow more rapidly over the stigma of another flower as compared to the same flower.

Eg. Apple, Grape.

Artificial Hybridisation

Emasculation

Female parent bears bisexual flowers, removal of anthers from the flower bud before the anther dehisces using a pair of forceps.

Bagging

Emasculated flowers have to be covered with a bag of suitable size, generally made up of butter paper, to prevent contamination of its stigma with unwanted pollen.

Emasculation-removal of anthers from the flower bud before the dehiscence of anther